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(54) System for mounting brake disc on wheel hub

(57) The invention relates to a system of float mounting of a brake disc 5 on the hub 1 of a wheel, which system comprises:

a) on the inner edge of the disc and peripheral edge of the hub, axial guiding elements 6 in relief, cooperating to centre the disc, block it angularly and guide it axially with respect to the hub;

b) axial stop members 13 capable of taking two positions:

- a first, axial blocking position, in which they are housed at the same time in two cooperating cavities 11, 12 in the opposite edges of the hub and disc,
- a second, axial releasing position in which they are housed only in one 11 of the two cavities,

c) manoeuvring means 16 for passing the stop members from one of their two positions to the other.

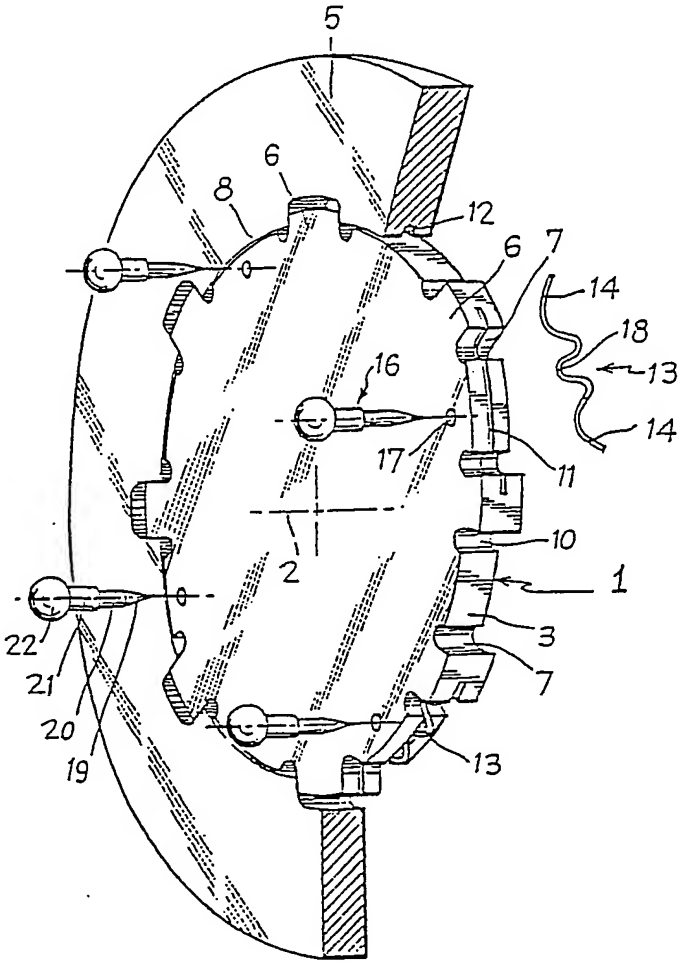

Fig.1

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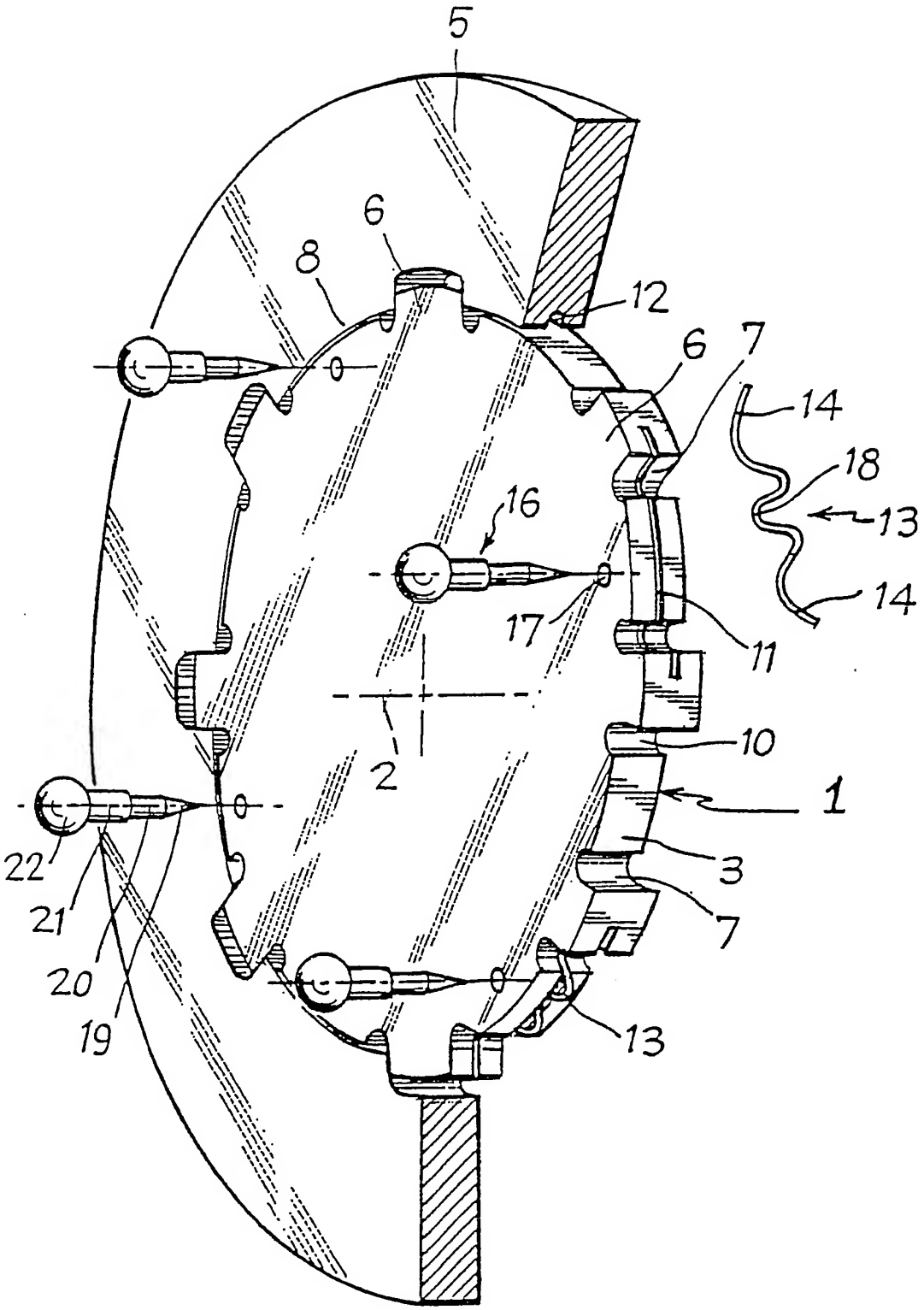

Fig-1

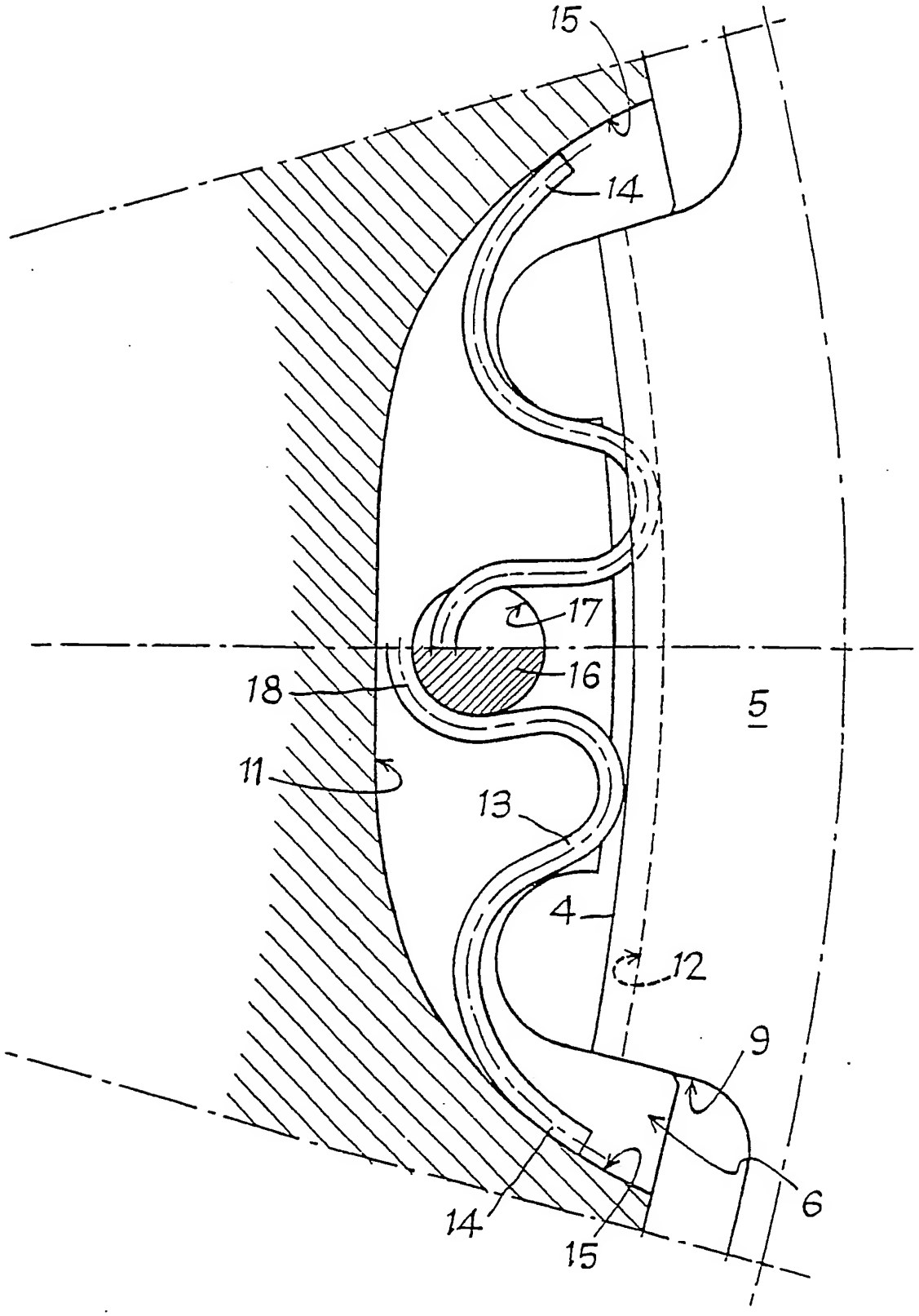

Fig-2

SPECIFICATION

System for mounting brake disc on wheel hub

The present invention relates to a system of coaxial mounting with axial float of an inner edge of an annular brake disc on the peripheral edge of a wheel hub, the two edges being opposite each other.

The brake disc is known to be mounted on the hub, or, more generally, on an intermediate metallic piece known as a "bowl" itself fixed on the hub. For greater convenience, reference will be made hereinafter only to the hub.

For connecting the disc on the hub, either a rigid mounting or a float mounting is used.

In a rigid mounting, the disc cannot move axially under the thrust of the pads by the hydraulic pistons.

Fixed mounting presents numerous drawbacks, including distortion of the disc due to the differential expansions between the disc and the hub.

Such distortion repels the pads and obliges the driver to "pump" on the brake pedal in order to return them into contact with the disc.

In particular with discs made of composite materials, this mounting has been finally abandoned in favour of the float mounting.

In a float mounting the disc may move axially by some tenths of millimetre, thus avoiding, in particular, the risks of distortion.

Furthermore, the heat transfers from the disc towards the hub are limited by the appreciable reduction of the surfaces in contact.

However, these currently used mountings present shortcomings. The main drawbacks which limit their potential use may be summarised as follows:

— considerable number of pieces to pass the braking torque, hence high mass and cost;

— long and delicate mounting and dismantling (brake thread on the screws or nuts);

— considerable lateral space requirement (projection of nut heads) and reduction of the friction faces;

— incomplete release of the stresses due to the differential expansions between the hub and the disc.

It is an object of the present invention to propose a novel system of float mounting which does not suffer from the above-mentioned draw-backs and does not involve any modifications in the brake caliper and its hydraulic part.

According to the invention, the mounting system comprises:

a) on the inner and peripheral edges, axial guiding elements in relief cooperating to centre the disc block it angularly and guide it axially with respect to the hub

b) axial stop members capable of taking two positions:

. a first, axial blocking position, in which they are housed and may abut axially at the same time in two cooperating cavities in the inner and peripheral edges,

. a second, axial releasing position in which they

c) manoeuvring means for passing the stop members from one of their two positions to the other.

The axial guiding elements in relief on one of the edges advantageously have two sides which are parallel and symmetrical with respect to a plane passing through the common axis of the disc and of the hub, which each cooperate with a parallel side of the respective cooperating element in relief on the other edge.

The axial stop members are advantageously elastic members, one of their two positions corresponding to a state without stress, the other corresponding to a state under stress, which are imposed by the manoeuvring means.

The axial stop members are advantageously springs in the form of a W, housed in slots perpendicular to the common axis of the disc and of the hub.

The manoeuvring means advantageously consist in pins with conical bearing surface, adapted to be guided from the outside into holes provided substantially transversely to one of the cavities for housing the axial stop members, so that, during guiding of the pins in their holes, their conical bearing surfaces abut on the axial stop members and cause them to pass from one of their two positions to the other.

The disc is advantageously made of a composite material. The springs are made of metal (refractory steel) or of composite material.

The invention will be more readily understood on reading the following description with reference to the accompanying drawings, in which:

Fig. 1 is a view in perspective, with parts torn away and exploded, of a disc mounted on a hub according to the invention.

Fig. 2 shows, in two half-sections perpendicular to the common axis of the disc and of the hub, a detail of the float mounting of the invention. The upper half-section shows the spring in position of blocking. The lower half-section shows the spring in compressed position of release.

Referring now to the drawings, the hub or bowl 1, shown in the form of a disc to simplify the drawings, which is generally made of metal, of axis 2, has a peripheral edge 3, generally cylindrical in form, on which is mounted the inner edge 4 likewise cylindrical, of the brake disc 5, of annular shape and of axis 2 common with the hub 1, and generally made of a composite material with high thermal and mechanical characteristics, such as a carbon-carbon composite (matrix of carbon, structural reinforcements of carbon), or carbon-silicon carbide composite (matrix of silicon carbide, structural reinforcements of carbon).

The peripheral edge 3 of the hub 1 bears eight guiding elements 6 in relief (i.e. of shape generated by a generatrix parallel to axis 2), regularly distributed over the periphery. The sides 7 of an element in relief 6 are parallel and symmetrical with respect to a median plane passing through axis 2.

The elements in relief 6 cooperate, for the angular blocking and centering of the disc 5 with respect to

edge of the disc 5. The sides 9 of elements 8 are respectively parallel to the side 7 which are contiguous thereto. This allows free radial expansion, without jamming, of the disc 5 and the hub 1 with respect to each other, the elements 8 being separated by channels deeper than the depth of penetration of the elements 6. The bottom of these channels is rounded along a curvature of greater radius in order to reduce the concentrations of stresses.

A clearance is provided between the perpheral edge 3 and the inner edge 4 with axial grooves 10 for ventilation and in order to limit heat exchanges.

The peripheral edge 3 comprises four slots 11, perpendicular to axis 2 adapted, in cooperation with four slots or simple grooves 12 which are thereopposite in elements 8 on the inner edge 4, to house blocking springs 13.

The springs 13, made of calibrated round wire, are substantially in the form of a rounded W whose base faces the outside of the hub 1. The ends 14 of a spring are bent towards its base so as to abut virtually tangentially on the rounded edges 15 of the bottom of the slots 11, consequently forming a very elastically supple bearing.

The shape of each spring 13 is such that, without other mechanical stress, a spring abuts both on the edges 14 of the bottom of a slot 11 and, by its base, on the bottom of a slot or groove 12. Gripped between the sides of these two slots, the spring 13 blocks at its level any overall axial translation of the disc 5 with respect to the hub, but without preventing, if need be, a differential heat expansion in the axial direction.

The springs are made of refractory steel to avoid their deforming at high temperature, under the effect of the centrifugal force.

Corresponding to each spring, a pin 16 may be introduced from the outside, parallel to axis 2, into an axial hole 17 formed near the edge 3 and opening in the slot 11, substantially at the centre of its angular extension, so as to be able to encounter and be introduced into the rounded median part 18 of the spring 13 placed in the slot.

The depth of the slot 11 and the location of the hole 17 are such that, when the pin 16 passes through part 18, it pushes the latter towards the bottom of slot 11 and makes it possible to release the base of the spring 13 entirely from the groove 12, eliminating axial blockage between the disc and the hub.

Each pin 16 comprises a tip 19 with conical bearing surface in order to facilitate introduction of the pin into the median part 18 of the spring, followed by a cylindrical part 20 for retaining the spring, then by a shoulder 21 limiting the penetration oif the pin. A spherical head 22 enables the pin 16 to be easily manipulated.

A system of float mounting with rapidly retractable axial stops, with a view to mounting or dismantling the disc by axial translation, has thus been produced according to the invention. In particular, this system allows:

1. free expansion of the hub without stressing the disc;
2. very rapid mounting, dismantling of the disc;
3. reduction of the lateral space requirement;
4. reduction of the thermal bridges between the disc and the hub;
reduction of the number of pieces (reduction of cost);
6. valorization of the composite materials of all natures by a suitable hold which reduces the risks of rupture of the disc.

CLAIMS

1. A system of coaxial mounting with axial float of the inner edge of an annular brake disc on the peripheral edge of a hub wheel, the two edges being opposite each other, wherein said system comprises;

a) on the inner and peripheral edges, axial guiding elements in relief, cooperating to centre the disc, block it angularly and guide it axially with respect to the hub;

b) axial stop members capable of taking two positions:

. a first, axial blocking position, in which they are housed and may abut axially at the same time in two cooperating cavities in the inner and peripheral edges,

. a second, axial releasing position in which they are housed only in one of the two cavities,

c) manoeuvring means for passing the stop members from one of their two positions to the other.

2. A system as claimed in Claim 1, wherein the axial guiding elements in relief on one of the edges have two sides which are parallel and symmetrical with respect to a plane passing through the common axis of the disc and of the hub, which each cooperate with a parallel side of the respective cooperating element in relief on the other edge.

3. A system as claimed in either one of Claims 1 or 2, wherein the axial stop members are elastic members, one of their two positions corresponding to a state without stress, the other corresponding to a state under stress, which are imposed by the manoeuvring means.

4. A system as claimed in Claim 3, wherein the axial stop members are springs in the form of a W, housed in slots perpendicular to the common axis of the disc and of the hub.

5. A system a claimed in any one of Claims 1 to 4, wherein the manoeuvring means consist in pins with conical bearing surface, adapted to be guided from the outside into holes provided substantially transversely to one of the cavities for housing the axial stop members, so that, during guiding of the pins in their holes, their conical bearing surfaces abut on the axial stop members and cause them to

pass from one of their two positions to the other.

6. A system as claimed in any one of Claims 1 to 5, wherein the disc is made of a composite material.

7. A system for mounting a brake disc on a wheel hub, substantially as described herein with reference to the accompanying drawings.

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